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A Model for Measuring the Direct and Indirect Impact of Business Intelligence on Organizational Agility with Partial Mediatory role of Empowerment (Case Study: Tehran Construction Engineering Organization (TCEO) and ETKA Organization Industries.co)

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Abstract

This paper aims to examine the influence of business intelligence on organizational agility through Partial mediating variable Empowerment. The statistical population of the study is consisted of Tehran Construction Engineering Organization (TCEO) and ETKA Organization Industries co. 102 questionnaires have been distributed among managers and stakeholders of information systems and these have been analyzed via SPSS and Smart PLS software. Within this paper the Popovic business intelligence questionnaire (2012), Sharifi& Zhang Organizational Agility and Spreitzer Empowerment have been used. The hypothesis of study is: Business Intelligence has direct and indirect influence through empowerment on organizational agility. Secondary hypothesis seek to examine the impact of business intelligence on organizational agility, business intelligence on empowerment and examining the impact of empowerment on organizational agility. Research studies imply the confirmation of study primary and secondary hypothesis.

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*Keywords:*Business intelligence, organizational agility, empowerment, digital economy, data mining

1. Introduction

Actual issues in modern world are of such complexity and interrelation that achieving to a proper insight and understanding about them and taking appropriative measures for encountering them calls for a powerful mind

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equipped with new viewpoints and separating from old mindsets .today, what some day used to be taken for granted is no longer of value and this is due to from one side organization inside and outside environmental complications and interrelations between factors and from other side is derived from enhanced uncertainty due to presence of various decision makers with conflicting views, environment dynamism and interrelation of decision outcomes (Azar, 2013).

Business intelligence system allows business users to following, understanding and information management in the organization. In these circumstances that organizations seek methods to further draw on valuable data within operational systems, the strategic role of BI is also increasing (Soroush, 2009).BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive Information to planners and decision makers (Negash,2004).

We refer to Business intelligence (BI) as the process of transforming raw data in to useful information to

Support effective and aware business strategies; capturing the business data and getting the right information to the right people, at the right time, through the right channel, is a crucial aspect of BI often referred to as pervasiveness (Turricchia,2013).

BI tools are friendly, iterative and interactive, allowing business users an easy access. This way, the user can directly manipulate data, thus having the possibility to extract all the value contained into that business data

(Azevedo,2011).

2. Business intelligence

Modern organization settings are quite complication and ever-changing. Organizations (governmental or private) are under great pressure for answering to the manager to change condition and innovation. These initiatives call for an agile organization with strategic, tactical and operational decisions that though they are complicated by are taken quickly. The decision making calls for a great deal of data, information and knowledge. One should process this information as required decision making and rapid, on time and ongoing processing is needed to become computerized (Tourban et al, 2010).

Additionally, today lifetime of commercial cycle of business has become shorter. Therefore rapid, aware and proper decision making is changed into a competitive obligation. Managers need good information at appropriate time and place (Farjami, 2015).

BI helps managers by analyzing data from different resources in better decision making at both strategic and tactical level, for ordinary usage, traditional information systems fare well, yet for organizational and function planning, new tools are needed for deeper directing the business analysis (Soroush, 2009).

BI is referred to as a set of mathematical and methodological models for analysis used for extracting information and useful knowledge from raw data for using complicated decision making process (Vercellis, 2013).We can enhance the insights provided by BI applications—specifically by using data-mining techniques, through simulation and modeling of real world under a “systems thinking” approach, improving forecasts, and contributing to a better understanding of the business dynamics of any organization (Raisinghani, 2004).

Business Intelligence by using Soft System Methodology has the necessary strength and flexibility for dealing with complexities of today organizational decision making. By using BI bases systems by decision makers, it is expected that the decision making quality would be enhanced. Using mathematical models and algorithms, analyzing more options with more accurate results and achieving to more effective decision are possible. Consequently, the most important advantage of business intelligence system is enhancement of decision making effectiveness process (Vercellis, 2013).

Companies require data mining tools together with Business intelligence tools in order to make effective strategic decisions (Heinrichs & Lim, 2003). Business intelligence tools help managers to understand weaknesses and strengths of the projects and processes (Omerali, 2012).

BI strategy should be designed to be agile and adaptive. It should be treated as a ’living’ artifact, which can be continuously refined to meet the enterprise objectives. BIstrategy must focus on communicating what you are planning to build, how you plan to build it, and when users can expect their requirements to be met (Pant, 2009).

3. Conceptual Model and describing operational variables definitions

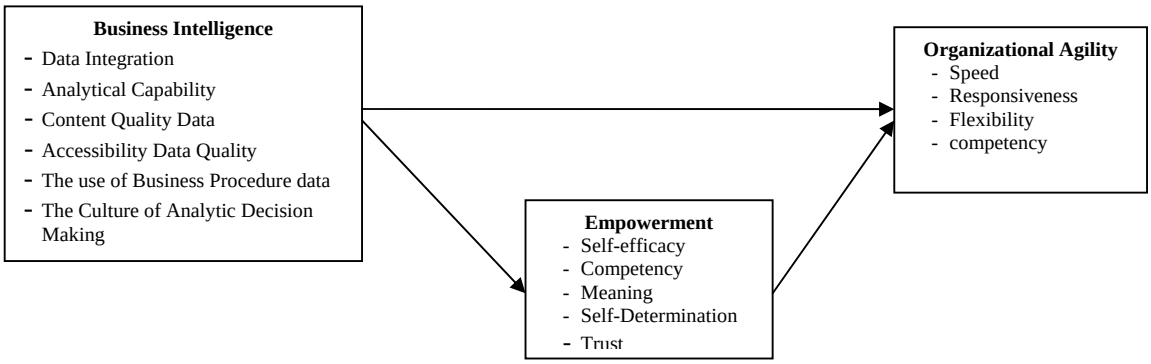

Fig 1. Conceptual Model (Sharifi& Zhang Agility Model, Spreitzer Empowerment Model and Popovic Business Intelligence).

4. Operational Definition of Research variables:

4.1. Business intelligence

- Data integration: Data with different resources would be integrated.
- Analytical Capability: data mining, dashboards, key performance indicators, trend analysis and scenario.
- Content Quality Data: information adequacy, accuracy and properness, understandability, comprehensiveness, lack of complexity, lack of conflicting information, up-to-datedness.
- Accessibility Data Quality: Consistency of information, real-time information, Comprehensive and Interactive feature of information.
- Using information over business process: identifying organizational problems, evaluating process with standards, reducing uncertainty, real-time reaction, value increase for customer and risk mitigation.
- The culture of Analytic Decision Making: using decision making backup system in ingraining decision making process, using real time information in decision making (Popovic, 2012:729-739).

4.2. Sharifi and Zhang Agility Model (2000)

- Responsiveness: it refers to ability to recognize rapid changes and reaction and using them.
- Competency: it represents the ability of attaining organization objectives and achievements.
- Flexibility: it is ability for directing different process and attaining to different objectives by similar facilities.
- Speed: it is ability to carry out activities in least possible time.

4.3. Components of Spreitzer psychology Empowerment Model

- Self-efficacy or as Vaten & Cameron noted (1998) accepting the personal consequence is a degree by which one can influence on strategic, administrative and operational outcome of a task (Spreitzer, 1995).
- Competency: it is a degree which one can carry out a task with skill and in a successful manner (Thomas & Velthouse, 1990).

- Meaning: it represents value of occupational objectives and intrinsic fondness to the job (Thomas and Velthouse, 1990). Significance is correspondence between job requirement and beliefs, values and behaviors (Spreitzer, 1995).
- Self-Determination: it includes activities entailed with freedom of action and experience of right to choose (Gagne & Deci, 2005).
- Trust: relation between subordinates and superiors (manager trust to employee and vice versa). Trust to fondness, competence, openness, and relying on others (Spreitzer& Mishra, 1997).

5. Results of Model Analysis

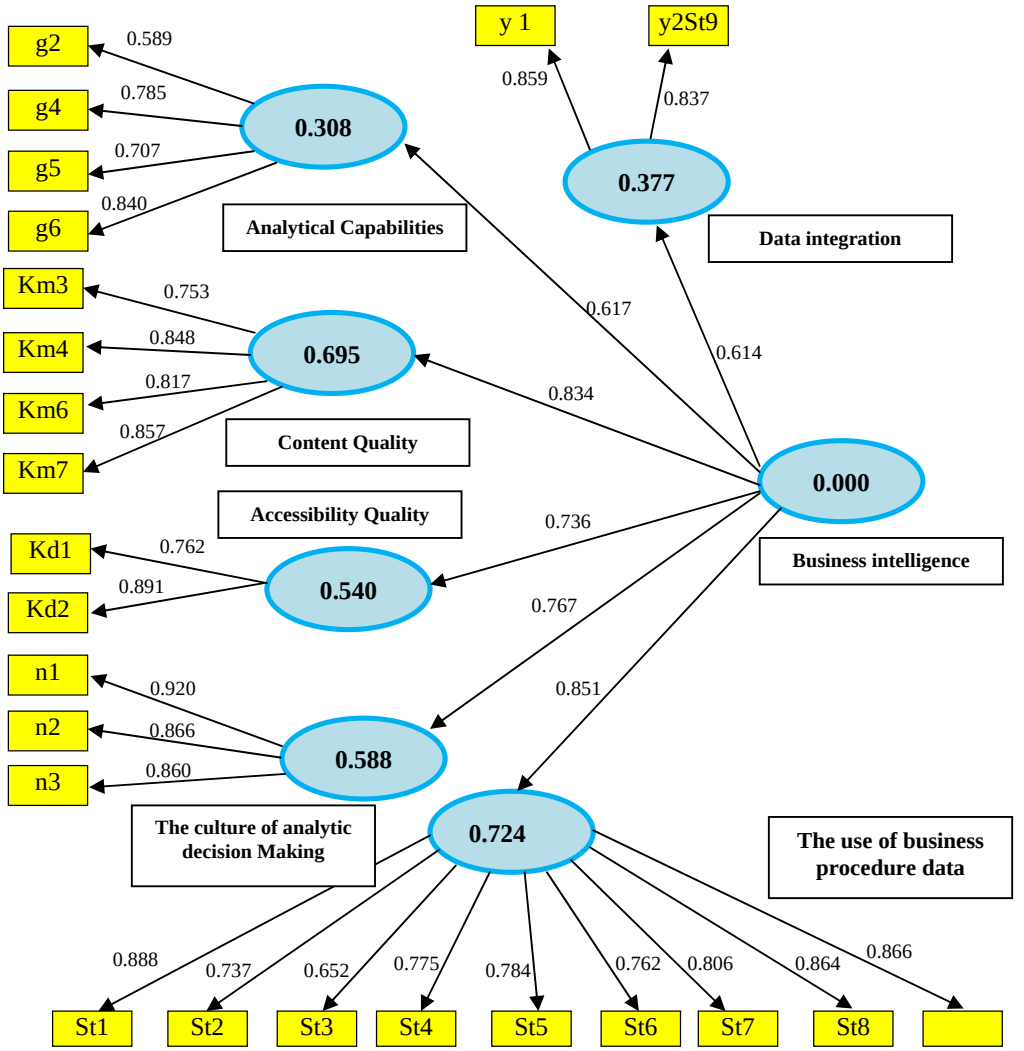

Fig 2.Results of business Intelligence Confirmatory Factor Analysis

Table1. Results of Business Intelligence Factor Analysis

Business Intelligence Composite Reliability and AVR			
Component	ρc	AVE	α
Data integration	0.84	0.72	0.61
Analytical Capability	0.82	0.54	0.71
Content Quality Data	0.89	0.67	0.84
Accessibility Data Quality	0.81	0.69	0.56
The Culture of Analytic Decision Making	0.91	0.77	0.85
The use of business procedure Data	0.94	0.63	0.92

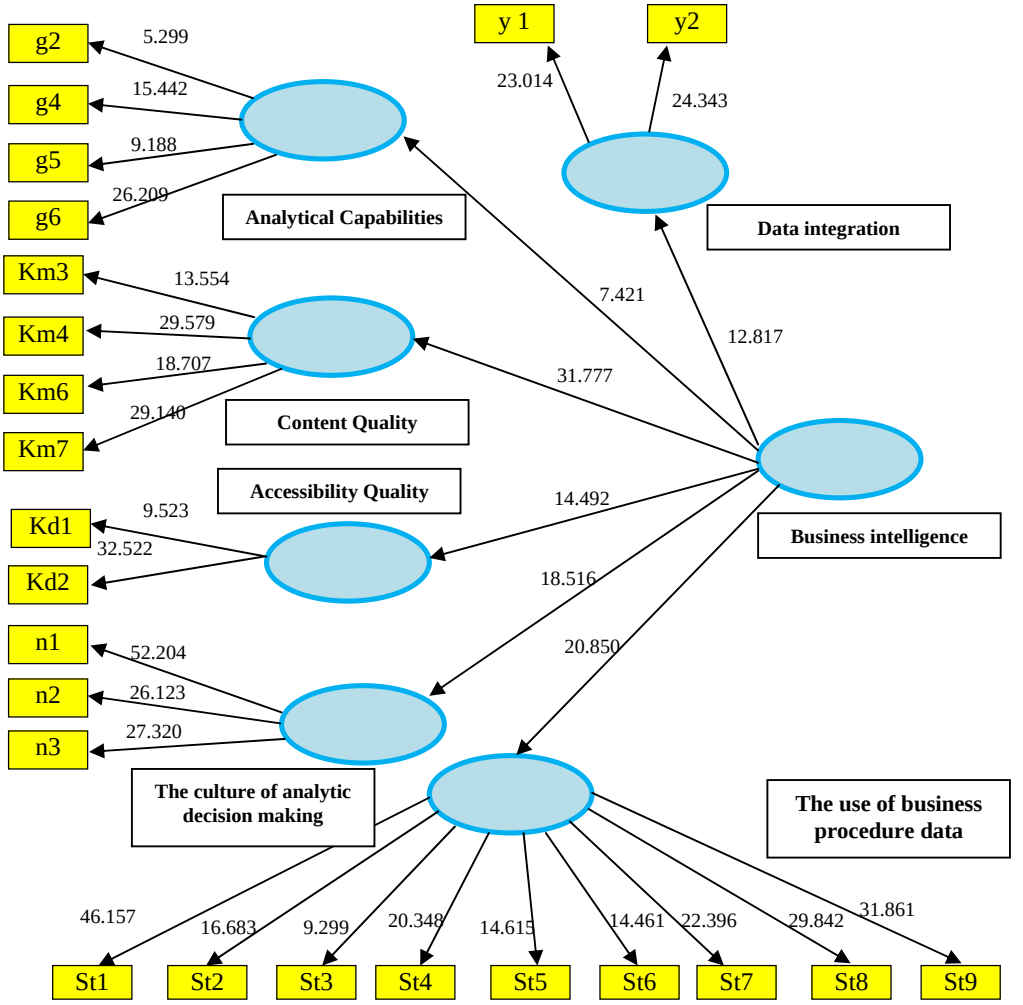

Figure 3.Results of business Intelligence Confirmatory Factor Analysis (T-values)

Table2. Cross Loading

Variable	Business intelligence	Empowerment	Organizational agility	AVE
The use of Business Procedure Data	0.73	0.35	0.40	0.57
Analytical capability	0.65	0.12	0.40	
Accessibility Data quality	0.7	0.26	0.39	
content quality Data	0.87	0.32	0.46	
The culture of Analytical decision making	0.76	0.25	0.46	
Data integration	0.71	0.10	0.40	
Trust	0.34	0.83	0.43	0.57
Self-Determination	0.22	0.79	0.28	
Meaning	0.09	0.64	0.15	
Competency	0.21	.67	0.26	
Self-efficacy	0.25	0.82	0.27	
Flexibility	0.30	0.25	0.68	
Responsiveness	0.37	0.18	0.72	0.60
Competency	0.44	0.33	0.86	
Speed	0.55	0.42	0.84	

Considering above tables all dimensions have the most load factor on themselves and the minimum distance between load factors related themselves is more than 0.1 that implies study parameters have good validity. In table 3 results related to correlation study and the second criterion of validity is presented.

Table3. Correlation Matrix and Average Square of extracted variance

Variable	Business intelligence	empowerment	Organizational agility
Business intelligence	0.75		
Empowerment	0.32	0.77	
Organizational agility	0.53	0.42	0.77

Considering table 3, extracted variance of mean square of all study variables is greater than their correlation with other variables. Therefore second criterion of examining divergent validity of study variables is established. Furthermore, the number beneath correlation matrix diagonal is reported from studying the relation between variables. As one can see, business intelligence correlation coefficient has positive and significance with empowerment and organizational agility. Correlation coefficient of empowerment is positive and significant organizational agility.

5.1. Descriptive indicators of measured variables

In this section, one presents the study variables descriptive indicators, in table 4 these indicators are presented.

Table 4.Descriptive indicators of study variables

Variable	Average	Standard Deviation
BI	3.92	0.81
Empowerment	3.60	0.70
Organizational agility	3.05	0.68

Table5 shows the T coefficient of study paths. T coefficient is greater than ±1.96 to ±2.58 at the 0.05 level of significant. As it is shown in figure 12, coefficient t of all paths is significant.

Similarly, in table 5 estimation of path coefficient and clarified variance of study model are reported.

Table5.Path coefficient and clarified Variance

Variables	Path coefficient	T coefficient	Clarified variance
On organizational agility from:			
Empowerment	0.25	2.712	
Business intelligence	0.47	5.106	0.36
On empowerment from:			
BI	0.32	4.176	0.10
Indirect impact of BI on organizational agility through empowerment	0.08	2.27	--

As it is shown in table 6, BI has direct and significant impact on organizational agility. BI has positive and significant influence on empowerment. Empowerment also has positive and significant impact on organizational agility. Empowerment has mediating role within relation between business intelligence and organizational agility. As it is shown in Table4, 36% of organizational agility variance and 10% of empowerment variance are clarified by study model.

Table 5, shows clarified variance degree, credit of Communality and redundancy of study variables. As it is shown in the table al values of Communality credit and redundancy are positive implying the appropriate quality of present study model.

Table 6.Clarified variance, credit of Communality and variables redundancy

Study variable	Clarified variance	CV-Redundancy Q2	CV-Communality
BI	_	_	0.571
Empowerment	10%	0.052	0.570
Organizational agility	36%	0.174	0.606

5.2. Structural Model Fitness

There are some methods for examining the model validity in PLS. these methods that is referred to as Cross-validation includes CV-Communality and CV Redundancy. Communality index measures quality of measuring each block. Redundancy index named as Stone-Geisser Q2 as well, measures the quality of structural model for each endogenic block. Positive values of these indexes imply appropriate quality of measuring and structure model. As it is shown in table5, cv- communality value and redundancy for all variables in this paper suggests the appropriate quality of measuring.

In addition to above indexes the overall fitness indexes in PLS is GOF index and one can use it for examining the validity or quality of PLS pattern in general. This pattern acts as Lisrel model fitness indexes and varies between zero and one and values approaching to one suggest appropriate quality of model (Ringel, 2010). This index

examines the overall prediction ability and whether tested model is effective in predicting endogenic variables or not (Abbaszadeh et al, 2012). At current paper for tested pattern absolute fitness index GOF is obtained 0.37 and the obtained value implies good fitness of tested pattern.

6. Test results of study Hypotheses

As considered in Tables 7and 8 all Hypotheses confirmed.

Table 7.Study primary hypothesis test results

Hypothesis	Path coefficient	T statistics	Hypothesis
BI influences indirectly on organizational agility through empowerment	0.08	2.27	confirmed

Table 8.Study hypothesis test results

Hypothesis	Path coefficient	T statistics	Hypothesis
Business intelligence has direct influence on organizational agility	0.47	5.106	Confirmed
Business intelligence has direct influence on empowerment.	0.32	4.176	Confirmed
Empowerment has direct influence on organizational agility.	0.25	2.712	confirmed

7. Summary

Agility is the gold standard for Information Era. Facing uncertain futures in a complex, dynamic, and challenging environment, organizations around the world are transforming themselves, becoming more information-enabled and network-centric. BI due to assisting in decision making process not only is essential for all organization but also has a vital role among necessitates of correct reaction to rapid environmental changes and rivals measures.

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